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COTTONWOOD

J. S. McKnight

Eastern cottonwood (Populus deltoides) and black cottonwood (P. trichocarpa), a western species, are the two commercially important species of poplar in the United States. More eastern cottonwood than black cottonwood is used commercially. Wood of both species is similar in appearance and properties. It is light in weight and color and has fairly straight grain and uniform texture. It is not strong and decays rapidly under conditions conducive to rotting. It is used principally for containers requiring light weight and color, for interior parts of furniture, for corestock in plywood, and for highgrade pulp.

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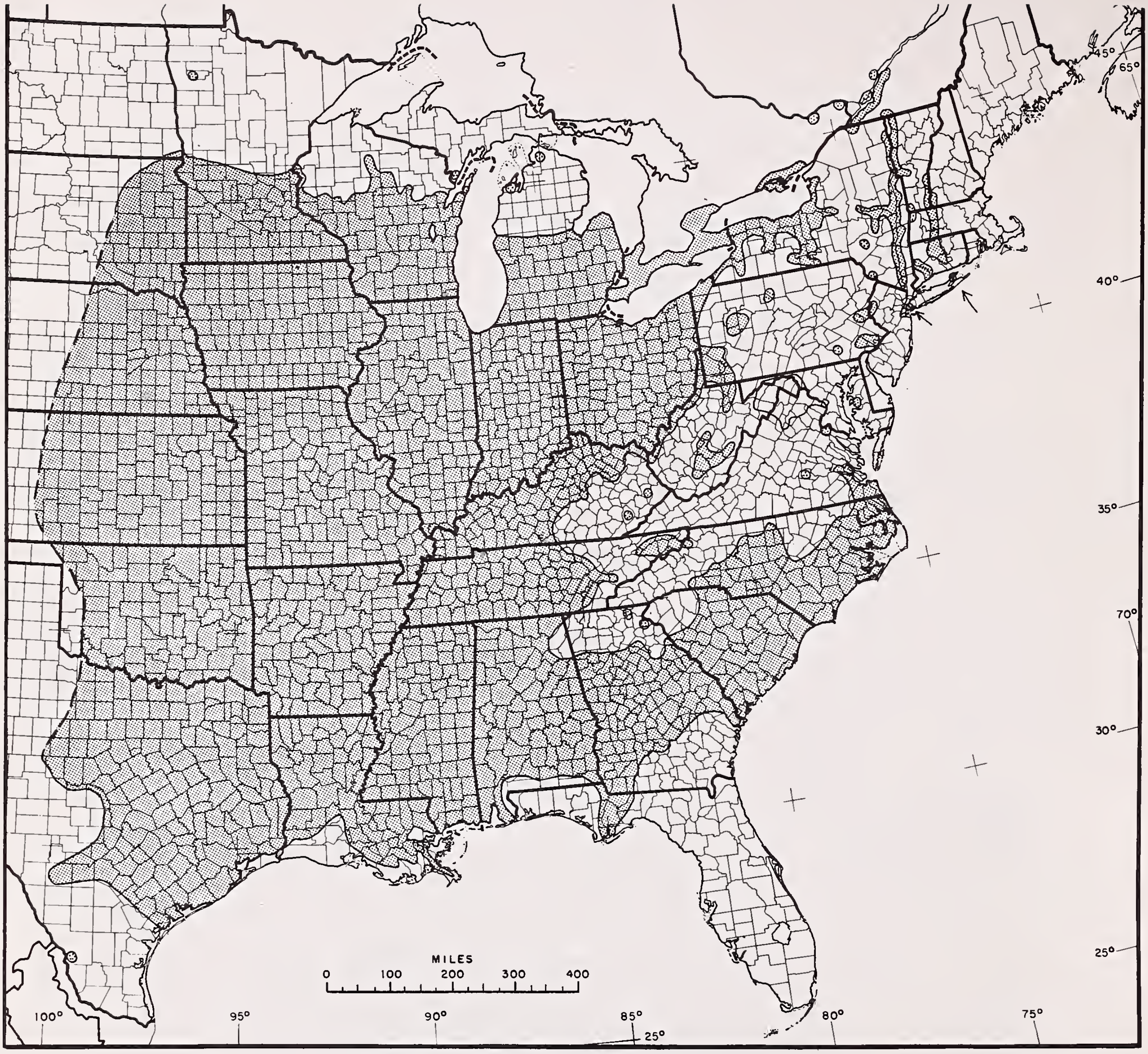

Figure 1.—Range of eastern cottonwood.

COVER—Black cottonwood in Coeur d'Alene National Forest, Idaho. F-403218

COTTONWOOD

(*Populus* species)

J. S. McKnight [1]

COMMON NAMES

Cottonwood is the general name used for about a dozen closely related species of the rapidly growing poplar family native to the United States. Only eastern cottonwood and black cottonwood, a western species, have commercial importance. Eastern cottonwood is also called eastern poplar, southern cottonwood, Carolina poplar, and necklace poplar. Other names for black cottonwood are California poplar, balsam cottonwood, and western balsam poplar. The aspens and balsam poplar belong to the same genus as the cottonwoods. Numerous other species of cottonwood grow in the United States, but none are important commercially.

DISTRIBUTION

Eastern cottonwood grows in every State from the Great Plains eastward (figs. 1 & 2), mostly on river bottom lands and rarely in the mountains. It is most important commercially along the Mississippi River and its major tributaries.

Black cottonwood, largest of the American poplars, grows along the Pacific Coast from Kodiak Island and southeastern Alaska to northern California. It also grows along the Sierra and Coast ranges and on scattered mountains in southern California and adjacent northern Mexico. Inland its range extends southeastward from northwest British Columbia to south-central Montana, central Idaho, and most of Oregon. It is also found on scattered mountains in northern Utah and Nevada. The tree grows chiefly on bottom lands, along stream banks, and in forest meadows.

Fremont, Palmer, and Parry cottonwoods grow in the Southwest. Both the plains and narrowleaf cottonwoods are widely distributed in southern Alberta and in most States west of the Great Plains except in the Southwest. Lanceleaf cottonwood grows in southern Alberta and the Rocky Mountain States. Swamp cottonwood is found on very wet sites and in swamps of the Atlantic Coastal Plain from Connecticut to Georgia and in small, wet patches elsewhere in the South. This species also grows in southeastern Missouri, southern Illinois, northern and southern Indiana, parts of Ohio, and locally in southern Michigan. Rio Grande cottonwood is found along stream banks and in valleys at altitudes of 2,500 to 7,000 feet in the Trans-Pecos region of Texas, along the Rio Grande River; north into New Mexico, southern Colorado, and southern Utah. Jacks cottonwood is found from Vermont to southern Quebec, southern Ontario, and Michigan.

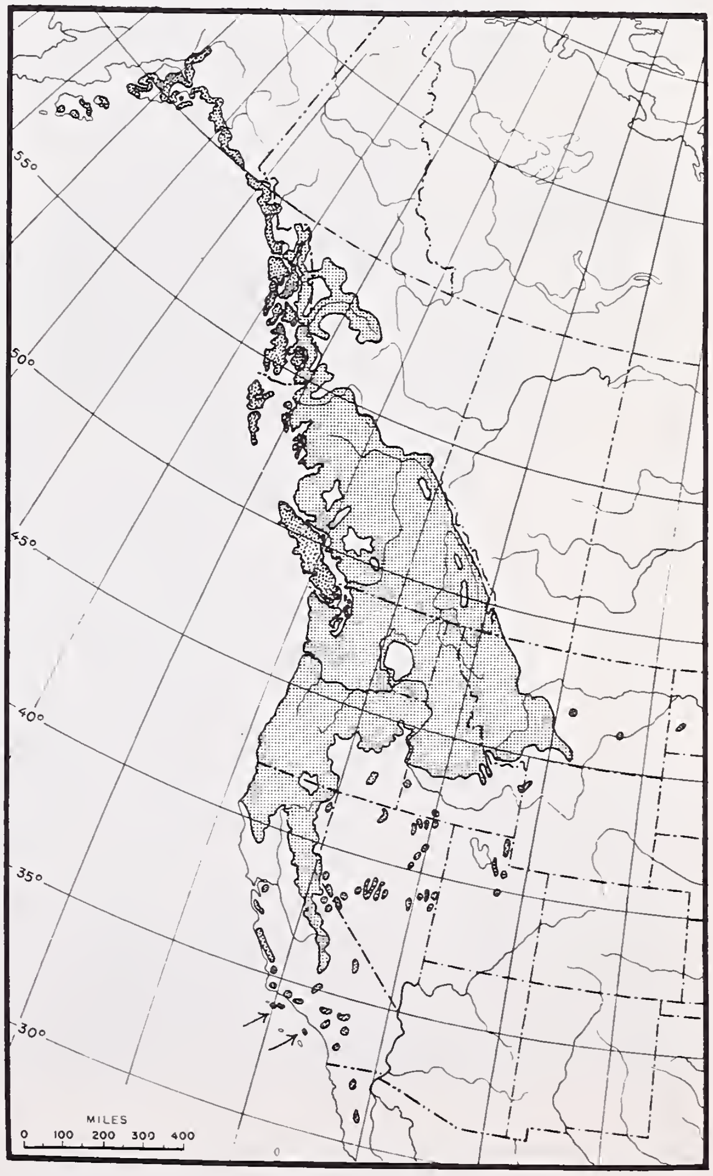

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Figure 2.—Range of black cottonwood.

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DESCRIPTION AND GROWTH

Eastern cottonwood is the fastest growing tree in North America. In well stocked, natural stands in the Mississippi Valley trees average 20 inches in diameter breast high and 120 feet tall at 35 years of age. On good sites they grow to heights of 175 to 190 feet and diameters of 4 to 6 feet in mature stands 55 to 65 years of age. Trees on good sites often grow 2/3 to 1 inch in diameter and 4 to 5 feet per year until they are 25 to 30 years old. Unmanaged stands may yield about 50 cords of pulpwood at 15 years, but stands with as much as 40,000 board feet per acre at age 55 have been encountered.

Eastern cottonwood grows mainly on alluvial soils of bottom lands (fig. 3). It grows best on sandy loam soils where there is a year-round abundance of moisture but not flooding, except possibly for short periods early in the growing season. In the lower Mississippi River valley the best sites are in the batture, the land between the levees and the river. On slopes it grows only in the lower areas that remain moist throughout the growing season.

Eastern cottonwood is the key species in the Cottonwood Type (Type 63) and grows chiefly in pure stands or in mixture with black willow. Sometimes it grows singly, sometimes in small groups in openings of hackberry, sugarberry, green ash, boxelder, river birch, white ash, slippery elm, black tupelo, American hornbeam, and eastern hophornbean.

Seed production starts in natural stands when trees are about 10 years old but reaches its optimum sometime after they are 30 years old. Planted and tended plantations on southern bottom lands seed at age 4 or 5 with maximum seeding as early as age 10. Good seed crops are usual; the very rare failures result from freezes occuring after flower buds have begun to open.

Seedlings and young stands are very intolerant and do not survive unless kept free of vegetation that threatens to overtop them.

Black cottonwood, the largest hardwood in the Pacific Northwest, grows mostly on bottom land, river bars, forest·meadows, and stream banks on a variety of soils ranging from moist gravels and sands to rich humus and occasionally clay. For best development it requires abundant moisture, nutrients, and oxygen combined with a pH between 6.0 and 7.0. It grows at elevations from sea level up to 2,000 feet in the northern portion of its range, but as high as 7,000 feet in valleys of the Selkirk Mountains in southern British Columbia, and up to 9,000 feet in California.

Black cottonwood is a key species in both the Black Cottonwood-Willow Type (Type 222) and the Cottonwood-Willow Type (Type 235). In the first, it is usually pure or predominant, but arborescent willows may predominate locally. In the Cottonwood-Willow Type, black cottonwood is typically mixed with other cottonwoods and willows. Its associates include water birch, thinleaf alder, boxelder, walnuts, ashes, and sycamores. It also grows in mixture with Douglas-fir, western white pine, western larch, Engelmann spruce, western redcedar, western hemlock, and white fir.

Times of flowering and fruit ripening vary according to altitude and geographic location. Annual seed crops are usually prolific, and dispersal may begin at any time from late May to early July. Seed is highly viable and good germination results if seed falls on bare, moist seedbeds on stream banks and bottom lands. Seedlings and young stands, like those of other cottonwoods, are very intolerant and must be kept free of seriously competing vegetation to survive. Juvenile growth on good sites is rapid, and dominant seedlings in the Pacific Northwest have attained diameters of 6.7 inches at breast height and a height of 48.5 feet in 9 years.

Black cottonwood trees reach maturity at 60 to 75 years. Sizes at maturity vary considerably. In Inyo County, Calif., the maximum diameter was 24 inches and height was 60 feet; but in Glacier County, Mont., trees on loamy soils were only 12.8 inches in diameter and 45 feet tall at 82 years. Growth and yield per acre are good. Net volume of 27,800 board feet (British Columbia log rule) at 60 years' age was reported for black cottonwood in the Skeena River Valley, B.C. This was a mean annual increment of 463 board feet per acre.

Male and female flowers of both eastern and black cottonwood are borne on separate trees and appear before or just as leaves begin to unfold. Staminate catkins of both species are 1½ to 2 inches long, about ½ inch wide, and densely flowered. Leaves of both species are alternate and generally deltoid (fig. 4). Bark of eastern cottonwood is thin and smooth, green to yellow, on young branches or trunks. On older trunks it is gray to black with broad flattened ridges. Black cottonwood bark is tawny yellow to gray on young stems, but ashy gray on older ones. On mature trees bark is deeply divided into broad, rounded, narrow-topped ridges (fig. 5).

SUPPLY

It is difficult to estimate accurately the total volume of sawtimber-size cottonwood available in the United States, because forest survey reports usually combine the volumes of cottonwood and aspen. The latest recent estimate of the available supply of eastern cottonwood (1963) after eliminating aspen was about 4 billion board feet, about half of which was in the South. This figure is about 1 billion board feet less than was estimated in 1945.

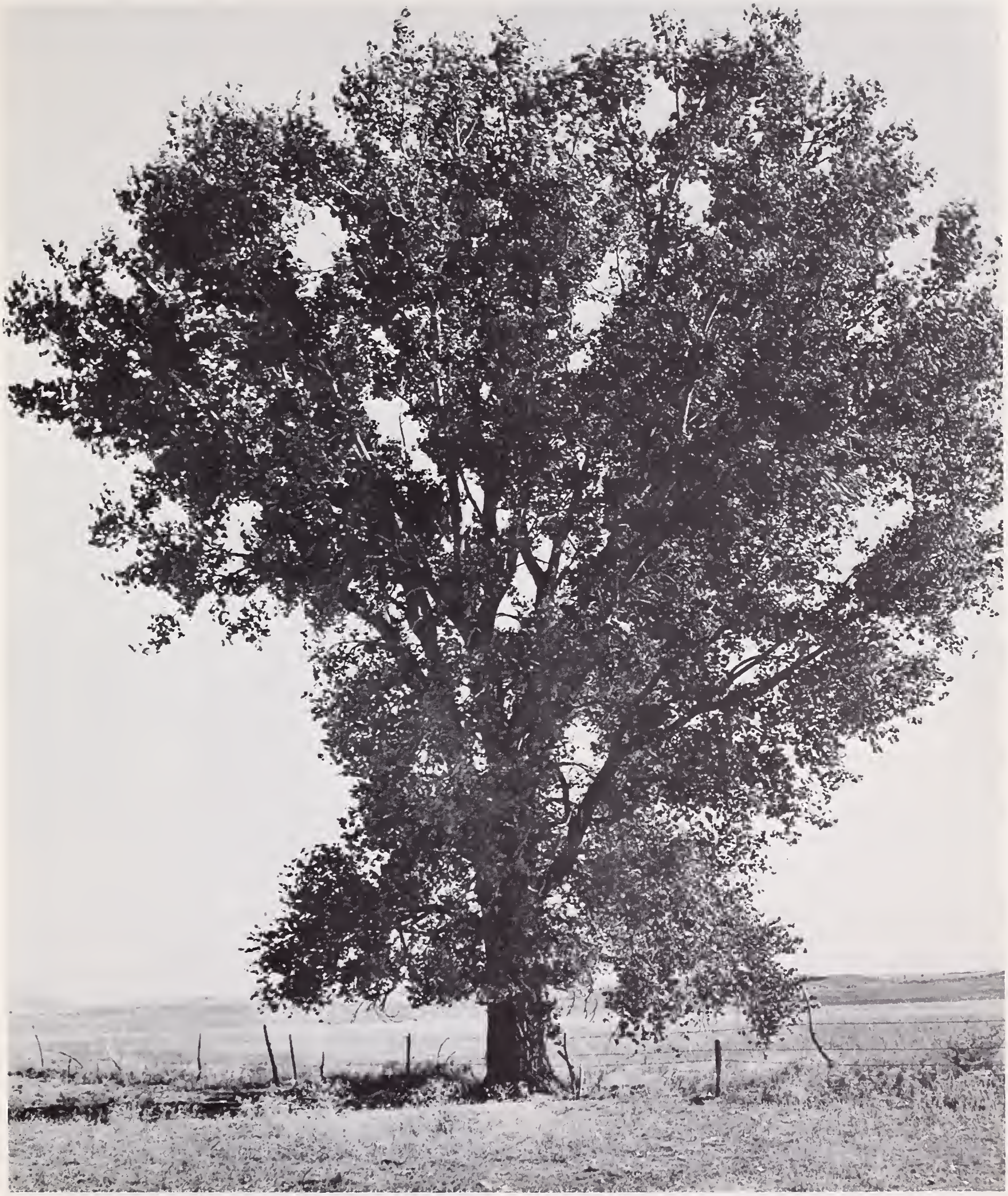

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Figure 3.—Eastern cottonwood, the fastest growing tree in North America.

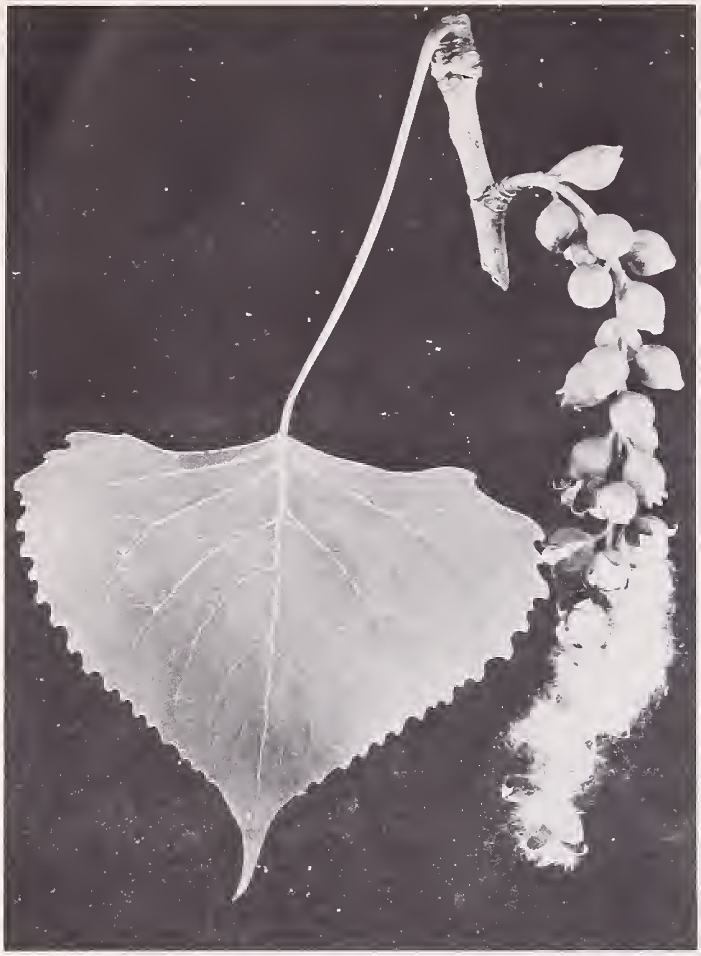

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Figure 4.—Fruit cluster and leaf of eastern cottonwood.

This reduction has resulted from stabilization measures effected on several major rivers. Stabilization resulted in the formation of less accretion land, where cottonwood has always been a principal species to form new stands; it has also resulted in less flooding of bottom lands, which deposited a layer of silt over many acres and encouraged the seeding in of new stands. Increased clearing of land for agriculture and other uses plus an increased demand for this species since 1945 have combined to decrease the available supply. The rate of this reduction was increasing in 1967. However, commercial planting of eastern cottonwood is increasing in the South (fig. 6).

During the same period (1945-1963), estimated volume of black cottonwood sawtimber was revised upward from 700 million board feet to 750 million, excluding aspen. Cutting in the western stands has been increasing materially only in recent years. Hence it appears that the indicated increase in available supply may be due to existing stands' growing to timber of larger average size; also, some additional stands may have become merchantable during the 18-year period.

PRODUCTION

Lumber production figures for cottonwood have varied greatly since 1900. From a maximum of 421,575,000 board feet in 1899, output declined to only 48,886,000 board feet in 1932. Since then it has recovered to a volume of 174,350,000 board feet used in manufacturing in 1960. These figures include the volume of lumber from all species classed as cottonwood; i.e., swamp cottonwood, some aspen, and several minor species of cottonwood that grow only locally in some western States. Eastern and black cottonwood supply by far the largest portion of this wood, but the volume of black cottonwood is small compared with that of eastern cottonwood.

A sizeable volume of logs is also used in produc-

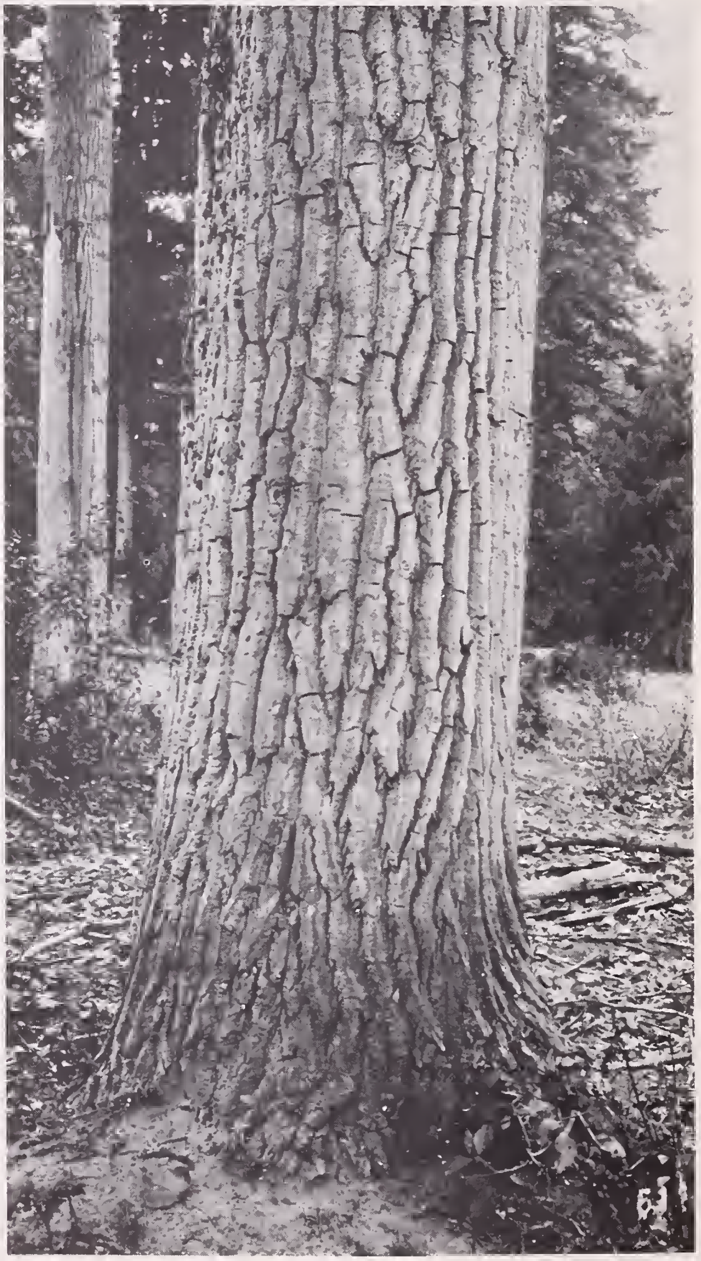

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Figure 5.—Bark of mature black cottonwood.

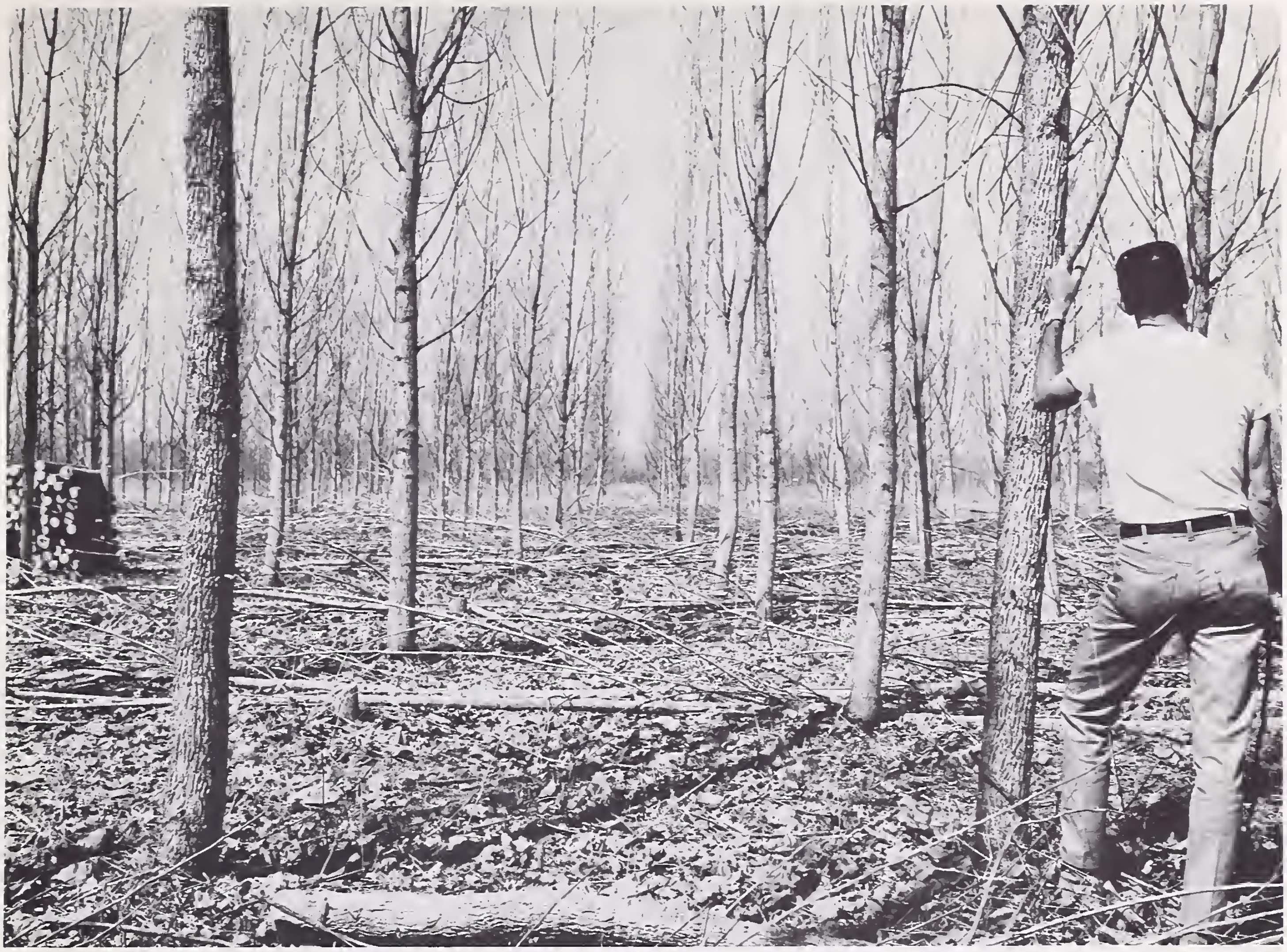

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Figure 6.—Southern plantation of eastern cottonwood has grown to minimum pulpwood size in 4 years.

tion of veneer and plywood. It is difficult to obtain accurate volumes for use in comparing present production with that of past years, but the trend seems to have been a steady decrease since about 1950. Recent loss of the egg case market has noticeably diminished demand. The Southern Hardwood Lumber Manufacturers Association believes that use of veneer logs may have dropped to as low as 25 million board feet annually by 1966. Reports for 1960 showed use of a total of 204,710,000 square feet, surface measure, of cottonwood veneer—roughly 85 percent of which went into containers.

In 1960 a total of 2,204,000 square feet, surface measure, of plywood was used by industries. Slightly more than one-third of this was used by the luggage industry; rubber and manufacture of miscellaneous plastic products utilized almost another third. Cottonwood is used for pulpwood and excelsior, but volumes have not been reported; however, it appears that use for pulpwood is increasing while use for excelsior is decreasing. Reports show 932,000 board feet of cottonwood bolts was used in 1960 almost entirely by special products sawmills, quite likely in the manufacture of furniture and millwork products.

CHARACTERISTICS AND PROPERTIES

The heartwood of both eastern and black cottonwood is brownish, but black cottonwood is the lighter. The sapwood varies in width, is whitish in both species, and is not clearly defined. Annual rings are not conspicuous but can be distinguished. The wood of both species is moderately light in weight; black cottonwood is the lighter—24 pounds per cubic foot at 12 percent moisture as against 28 pounds per cubic foot for eastern.

Eastern cottonwood is moderately weak in bending and compression, moderately soft, and relatively low in ability to resist shock. Black cottonwood rates below eastern cottonwood in strength properties, because of its lighter weight. Neither one is durable under conditions favorable to decay.

The cottonwoods are prone to warping, but their shrinkage is moderate. They glue satisfactorily, have low nail-holding ability, do not split easily, and hold paint well. They have a sour odor when moist but are odorless and tasteless after seasoning.

The wood is easily reduced to a highly desirable grade of paper pulp by any of six processes. Since it naturally has light color, it requires little bleaching for most uses.

The principal disadvantage associated with the wood is the frequent presence of gelatinous fibers known as "tension wood," which results in fuzzy grain when the logs are sawed into lumber or cut into veneer. Tension wood causes buckling of veneer as soon as it is cut and often shrinks abnormally during drying.

PRINCIPAL USES

Cottonwood is utilized in several classes of material: lumber, veneer, plywood, short bolts, and pulpwood. Lumber and veneer go mainly into nailed and wirebound wood boxes and crates, now mostly beverage cases. It is highly preferred for many food containers and packing cases because of its light weight; its freedom from odor and taste; and its light color, which makes stenciling easy. Cottonwood lumber and veneer are also used for interior parts of furniture; plywood, both corestock and face veneer; agricultural implements; and woodenware including cutting boards, meat boards, and a variety of fixtures produced in millwork plants. Some veneer is now used in matches.

The bolts are used principally by special products sawmills to produce numerous small articles and prefabricated furniture parts.

Use of cottonwood pulpwood is increasing because of the rapidly expanding demand for pulp, especially in the manufacture of high grade book and magazine paper. This increasing use is causing intense competition for cottonwood stumpage in the South and fostering extensive planting ventures. It is also effecting better utilization of harvested timber by encouraging the removal of more wood from the tops of trees.

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